APPROVALS

Advanced Technology Ordnance Surveillance (ATOS)
Advanced Concept Technology Demonstration (ACTD)

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This management plan is an executive level document that is intended to outline the basic strategies necessary to execute the ATOS ACTD. Any changes to this basic plan will require approval by the

Oversight Panel, published as part of the proceedings to the Panel meeting, and appended to this document.

SECTION 1

OVERVIEW

1.1 BACKGROUND

The Advanced Technology for Ordnance Surveillance (ATOS) Advanced Concept Technology Demonstration (ACTD) is a Department of the Navy (Naval Sea Systems Command, Naval Surface Warfare Center, Indian Head Division) initiative sponsored by the United States European Command. Program support is provided by the U.S. Army Materiel Command, Operations Support Command (OSC).

The ACTD will address both the effective management of the complex DoD munitions stockpile and the need for more timely and accurate ordnance surveillance techniques. The effective management of the large DoD munitions stockpile has long been hindered by labor-intensive inventory methods and stockpile inaccuracies. The attendant loss of asset visibility also creates a host of problems for the acquisition manager, the logistician, the storage custodian, and the war fighter. Overall mission readiness is degraded because needed munitions either cannot be located or, when located, are not in the as-stated condition. In a similar fashion, current surveillance methods lack critical environmental storage profiles. Storage conditions, particularly temperature and humidity profiles, can have significant impacts on ammunition safety and reliability. By utilizing the latest in Automatic Identification Technologies (AIT) and Micro electrical Mechanical Sensors (MEMS), real-time data can provide a relatively easy and very cost-effect solution to these shortfalls.

The ATOS ACTD was ranked 6th out of 14 approved ACTDs for FY-01 by the JROC. ATOS will provide technology needed to meet the needs of the war fighter by improving the logistics process for class V supplies. The technology ATOS will develop may also be applied to other classes of supply improving the overall logistic pipeline for the future.

1.2 MILITARY NEED

Joint Vision 2020 states that "Focused Logistics will effectively link all logistics functions and units through advanced information systems that integrate real-time total asset visibility with a common relevant operational picture." It also states that by FY 04 we must "implement fixed and deployable automated identification technologies and information systems that provide accurate, actionable, total asset visibility." This ACTD focuses on providing relevant, accurate and actionable data to advanced information systems using fixed and deployable automated identification technologies. In addition to Joint Vision 2020, Combatant CINC's have identified to the Joint Staff a requirement for "…visibility of class V ammunition that is on-hand, in-transit or at the point of origin awaiting shipment. The

information must be current, real-time information with projected departures and arrivals through each node of the distribution system." This requirement is prioritized as number 11 of 129 Combat Support requirements identified by the CINC's during the development of the Global Combat Support System (GCSS).

1.3 CURRENT USEUCOM AIT USAGE IN MUNITIONS OPERATIONS

1.3.1 U.S. Air Forces Europe (USAFE). USAFE currently does not incorporate any AIT capabilities to assist with accountability, maintenance, or management of munitions assets. The Air Force accountable computer system called "Combat Ammunition System-Base" (CAS-B) is undergoing a major revision. It will be released in three spirals with the first to be released in Sep 02 and the final one on Sep 03. According to the requirements document the new improved CAS-B must allow AIT developments to communicate with CAS-B. At this time a 2-D bar code labeling initiative is underway at Eglin AFB, Florida for inclusion in CAS-B during Spiral two release (projected Feb 03). We see this as a first step until RFID technology can be developed and fielded to replace bar-code labeling.

1.3.2 U.S. Naval Forces Europe (USNAVEUR). USNAVEUR currently does not incorporate any RF AIT capabilities to assist with accountability, maintenance, or management of munitions assets. There is limited AIT with ROLMS and bar coding. We also see this as a first step until RFID technology to be developed and fielded to augment legacy systems and bar-code labeling.

1.3.3 U.S. Army Europe (USAREUR). USAREUR currently uses AIT at the ASP level to eliminate discrepancies concerning shipments and receipt of munitions from external sources. The use of AIT devices also eliminates errors, made during imputing data into the system by SAAS-MOD operators, and provide a near real time status of in-bound/out bound shipments within the pipeline. AIT provides an automated process by allowing SAAS-MOD operators an automated method of migrating data from the transportation system (MTMS) into the SAAS-MOD data base, eliminating the operators from manually keying data into the SAAS-MOD system.

1.3.4 OSC. The OSC has applied Automatic Identification Technology (AIT) to its Intransit Visibility (ITV) processes in CONUS and OCONUS. Traffic managers are often required to provide shipment status for various customers, i.e. higher headquarters, other commands, item managers, contractors, and/or soldiers in the field. Future plans include enhancement of the ITV system to provide asset visibility for ammunition.

The Joint Transportation Team of the Operations Support Command (OSC) uses the Munitions Transportation Management System (MTMS). The organization is chartered by DoD to consolidate and ship all ammunition for Outside Continental United States (OCONUS) requirements for all Services. MTMS is the source data entry point for export processing of movement requirements. It interfaces with CONUS Freight Management (CFM), Integrated Booking System (IBS), Worldwide

Port System (WPS), Defense Transportation Tracking System (DTTS), Global Transportation Network (GTN) and Joint Hazard Classification System (JHCS).

The Munitions Transportation Management System - Field Module (MTMS-FM) introduces a suite of Automatic Identification Technology (AIT) and Automated Information System (AIS) hardware and software. It integrates the Transportation, Supply, Storage, Inventory and Surveillance databases. The AIS piece automates and streamlines the entire transportation documentation process, eliminates redundant data entry, and improves timeliness by eliminating needless paperwork. The MTMS-Field Module provides source data input to all the munitions related systems, as well as prepositions data worldwide. The AIT piece is used at the depots to create readable Barcode Labels and Military Shipping Labels for every box and package of ammo stuffed in a container. It is also used to send source data to the RF Burn Site for preparation of a global radio frequency (RF) tag for each container that leaves the installation. The RF (advanced receipt data) transmission(s) is/are sent to the ITV Server in theater, and is used to track containers through the transportation nodes, and provide receipt data and in-the-box visibility at the receiving ammunition supply point.

1.4 TECHNOLOGY SOLUTION TO MILITARY NEED

The ATOS ACTD will demonstrate an automated munitions inventory and surveillance capability that will allow joint theater logisticians to monitor the distribution and environmental conditions of selected munitions. ATOS will monitor the environmental history of munitions with automated transmission of environmental data to repositories at selected intervals, providing insight into whether munitions have been exposed to conditions that may adversely impact their safety and reliability. ATOS will provide visibility of munitions within a storage environment, and in conjunction with "in-transit" infrastructures, during movement from storage environment to operating units. This capability will significantly enhance theater ordnance visibility, accountability, safety and life cycle management.

1.5 SYSTEM CONCEPT – OVERVIEW

The following is a general description of the ATOS system concept:

- ATOS tags are attached to the ammunition item containers or pallets and periodically communicate with a fixed, portable, or hand-held reader. The reader passes this information via a relay (RF or LAN TBD) to a "Preprocessor" located at the operations or command center.

- This information will allow us to determine the location of the item (by magazine or ASP berm) as well as provide us with constant environmental monitoring of the item.

- The preprocessor turns this information into a usable format and passes it to the surveillance and the inventory management Automated Information Systems (AIS). This in-storage visibility takes

us one step closer to achieving Total Asset Visibility (TAV) per Joint Vision 2020 and with accurate surveillance information, neither of which are available today.

- When an item is shipped it enters into the current "in-transit visibility" RFID network. In transit visibility is attained through the "global RF tag" on the outside of the container and through satellite tracking Defense Transportation Reporting and Control System (DTRACS) if required. The ATOS tag (inside the shipping container) stores environmental data during the shipping process for up to 90 days. Once it reaches its final destination and is near a reader it dumps the stored data to the pre-processor and begins retransmitting visibility and surveillance data periodically.

Possible shortfalls of this system include the following:

- Assets physically or electronically dissociated from their respective RFID tags could undergo severe environmental changes which would not be automatically captured by ATOS. A specific example would be air-delivered munitions being prepared for and during captive carry, which are un-crated, loaded onto delivery platforms, sorted, unloaded from the delivery platforms, and re-crated. Although environmental changes occurring within these time frames would not be automatically captured, ATOS is allowing for an updateable free field comment section on the RFID tag which could be used to document and account for such periods of time. If services elect to utilize this feature, such documented periods of time could be successfully assessed through modeling. Ultimately as ATOS evolves into a fully embedded system, this shortfall ceases to be of concern.

- A second potential shortfall is that without actually observing the ammunition item in storage it is impossible for the inventory manager to determine if the tag is still attached to the item or if it has been removed. This problem would also be resolved by eventually embedding the tag as described above.

The ATOS concept is illustrated in the following diagram:

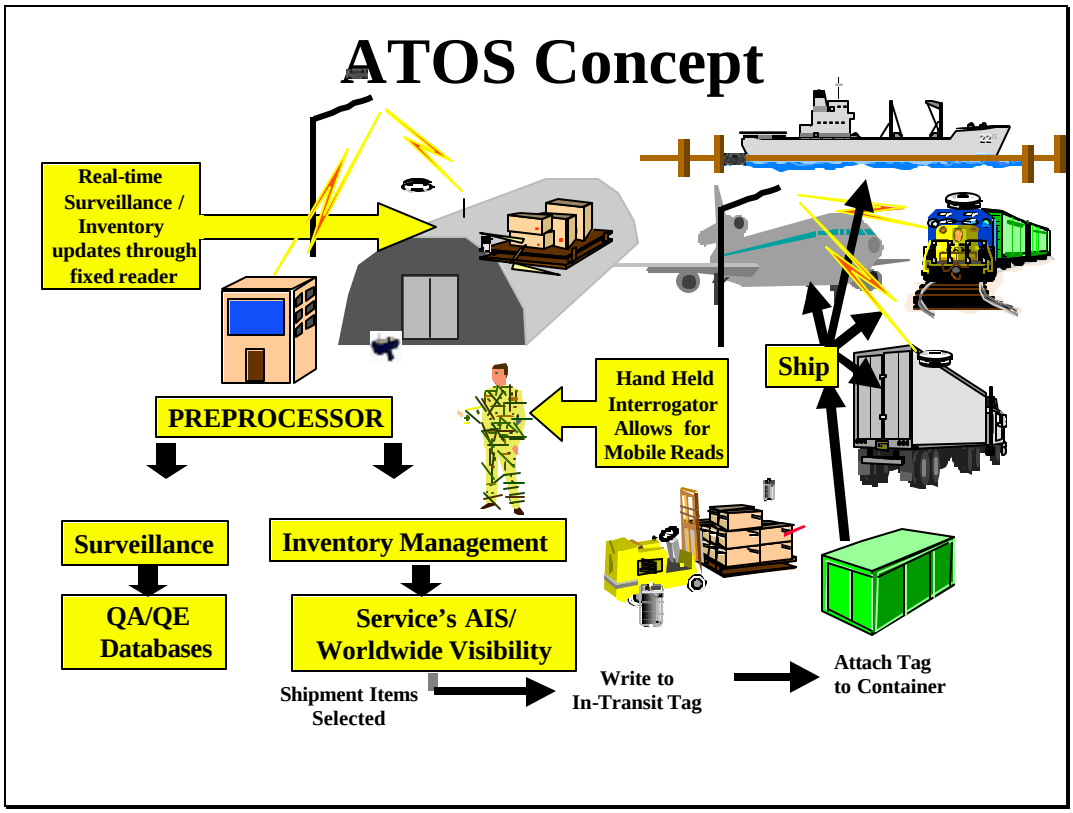

Figure 1.

This concept offers solutions for both the inventory accountability and surveillance problems, by utilizing the latest in Automatic Identification Technologies (AIT), to provide near real-time data to the logistician and war fighter. Examples of currently available contractor-off-the-shelf (COTS) AIT devices, specific to this initiative, are:

- Radio Frequency Identification (RFID). This name is generally assigned to devices that use radio frequency communications to automate data collection and identification, without direct contact or line-of-sight between components. RFID systems typically consist of small radio tags, attached to assets that communicate, either actively or passively, with fixed or mobile readers (interrogators). Such systems allow hands-off data gathering, thereby significantly enhancing total asset visibility, environmental monitoring and inventory accuracy, speed and efficiency.

- Microelectromechanical Systems (MEMS). These sensors are extremely small, but powerful, means of automatically sensing and recording the environmental factors influencing the service life of ordnance items (e.g., temperature, humidity, shock, and energetic stabilizer depletion). Heretofore, expensive sample testing and statistical analyses have been the only methods available for making predictive determinations. Now, however, MEMS offers the capability for life-cycle environmental

monitoring of ordnance and various weapons systems on a near real-time basis, i.e., providing the ability to monitor missile status and readily identify weapons needing maintenance or replacement.

These two technologies will be integrated on a small Application-Specific Integrated Circuit (ASIC) chip using proven manufacturing techniques. This credit-card size emitter tag will then be placed on or near munitions items individually on containers or palletized munitions. Handheld readers, as necessary or practical, for in-transit or shipboard monitoring will augment fixed interrogators in shore or ship magazines. These portable readers will also be able to read barcode and button memory devices using emerging DoD standard data elements. Inventory and surveillance information will be fed to the appropriate surveillance and inventory MIS systems, via a variety of communicating means.

The capabilities proposed by this ACTD have potential applications in addition to high dollar, low-density munitions. ATOS tags could also be applied to any environmentally sensitive commodity as well as any commodity that requires frequent inventory and/or surveillance. Examples include medical and biological supplies such as blood products, subsistence, propellant charges, and category I munitions such as Stinger missiles.

The capability to attach an RFID tag to additional ammunition items could lead to accountability and management practices that can never be achieved with current methods (to include 2-D bar code labels). The ability to see all munitions assets whether built-up on the flight line or stored long term in a magazine will give us total asset visibility and lead to the following major improvements: real-time explosive safety (monitor compatibility and explosive weights), ability to calculate future munitions requirements, even with the battlefield munitions requirements changing hourly, streamline munitions ordering and reducing hazardous munitions transportation, by allowing real-time asset balances to be viewed by the ammunition control points throughout the world, and finally give each combatant commander the complete picture of munitions asset availability within his reach .

1.6 SUMMARY

The ATOS ACTD will demonstrate an automated joint munitions inventory and surveillance capability that will allow theater logisticians to monitor the environment and distribution of selected critical and/or high-risk munitions and/or their individual components. ATOS will collect the temperature and humidity history of munitions with automated transmission to a data warehouse at selected intervals. This will provide ordnance technicians insight into whether selected munitions have been exposed to conditions that may adversely impact their safety and reliability. ATOS data will also allow logisticians to track selected munitions (and/or their components) within a storage environment and, in conjunction with current "in-transit" infrastructure/technologies, from storage environment to operating units. This capability will significantly enhance theater ordnance visibility, accountability, safety and life cycle management from sub-component to complete rounds.

SECTION 2

CONCEPTUAL AND TECHNICAL APPROACH; DEMONSTRATION AND ASSESSMENT; RESIDUALS

2.1 CONCEPTUAL APPROACH

2.1.1 Overview. During the three-year program development and demonstration phase, ATOS will integrate existing technologies into program-developed components and operationally demonstrate the system. To accomplish this program objective, a series of parallel and concurrent activities will need to be performed. These include:

- Identification, validation, and verification of the functional requirements, these requirements will be published within the ATOS Functional Requirements Document (FRD).
- Product development and technical integration using commercial-off-the-shelf (COTS) technologies when available and incorporating current practices and infrastructure as well as modernization efforts through the development of a standard data interface.
- Initial Testing and Evaluation (IT&E).
- Limited technical modification and refinement.
- Operational Test and Evaluation (OT&E).
- Military Utility Assessment using the CONUS/USEUCOM ammunition supply chain pipelines. Within CONUS and USEUCOM, it will be evaluated using existing storage and transportation infrastructure during normal operations.
- Transition to acquisition. Prior to transition, ATOS will be certified to interface with service AIS and by appropriate DoD security and safety authorities.

Specific technologies being developed or incorporated into ATOS include the following components:

- Radio Frequency Identification (RFID) "tags" including environmental sensors.
- Fixed, portable and hand-held readers.
- Pre-processor data base.
- Software interfaces with existing service systems to include SDS, SAAS-MOD, CAS-B, and ROLMS.

ATOS will be demonstrated and assessed as a system aggregate of these technologies as applied to an operational scenario.

2.1.2 USEUCOM Component Operational Concepts.

2.1.2.1 USAFE.

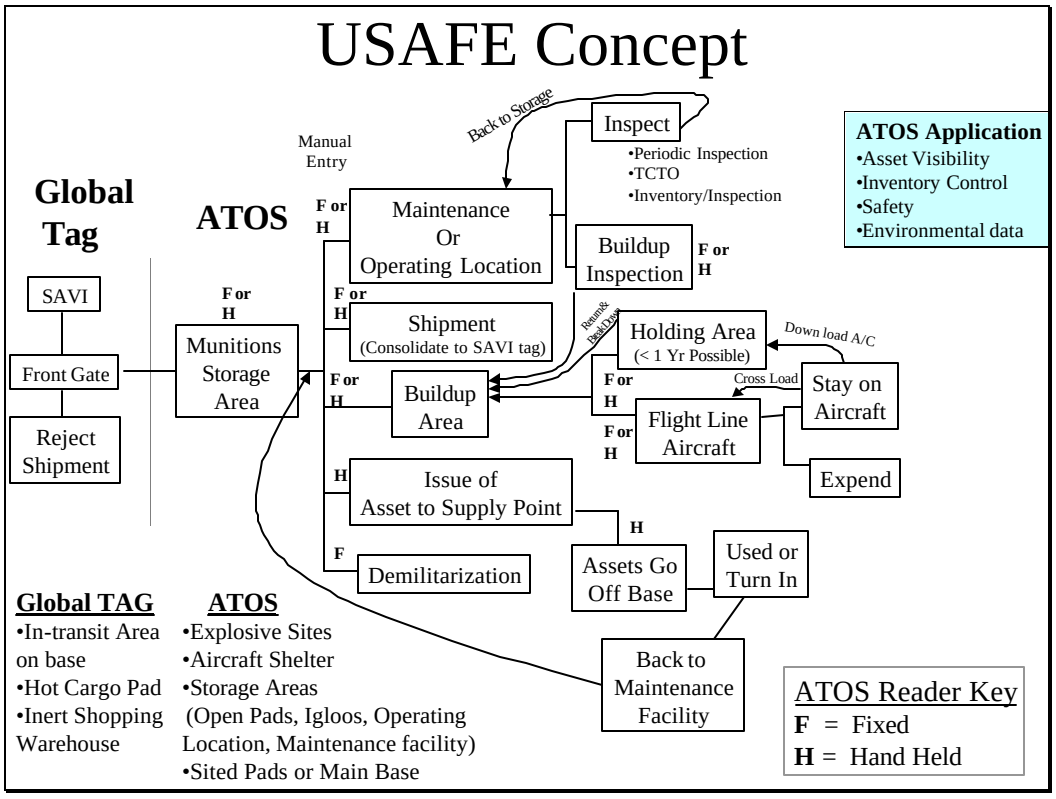

Figure 2.

USAFE Use Concept Narrative

Items would arrive at a munitions storage area and be stored in a munitions magazine, open pad, or ISO container where data would be collected through the use of a fixed/mobile reader. Once in storage asset could be subsequently subjected to several different kinds of actions. 1) Assets could be taken to a maintenance or operation facility where breakout of the container for inspection or issue would occur. If for inspection, assets would be placed back in the same container and returned to storage. If issued to a supply point, remaining assets after issue would be placed into original container and returned to storage. Assets issued might leave the munitions storage area and be stored elsewhere on base or could be placed back into a storage location marked for that supply point. The maintenance or operating facility would have to have the ability of changing indicative data on the tag and in the PPDB. Assets need to be tracked if restored in munitions storage area or taken to the flight line. 2) Assets could be selected for shipment to another base. The items could be tracked until the "Global RF" tag is

attached to the shipping container. 3) Assets could be sub-components and be selected to be built-up into a complete round (fuzes, fins, delay elements, bomb bodies, etc..). These assets would be delivered to a buildup area and many components would be combined to make the end item. This end item would be assigned a build code that is unique to that production quality (all sub-components have same lot numbers). The buildup area requires the capability to consolidate these items into on build code in the PPDB and be tracked by that method.

2.1.2.2 USAREUR Concept.

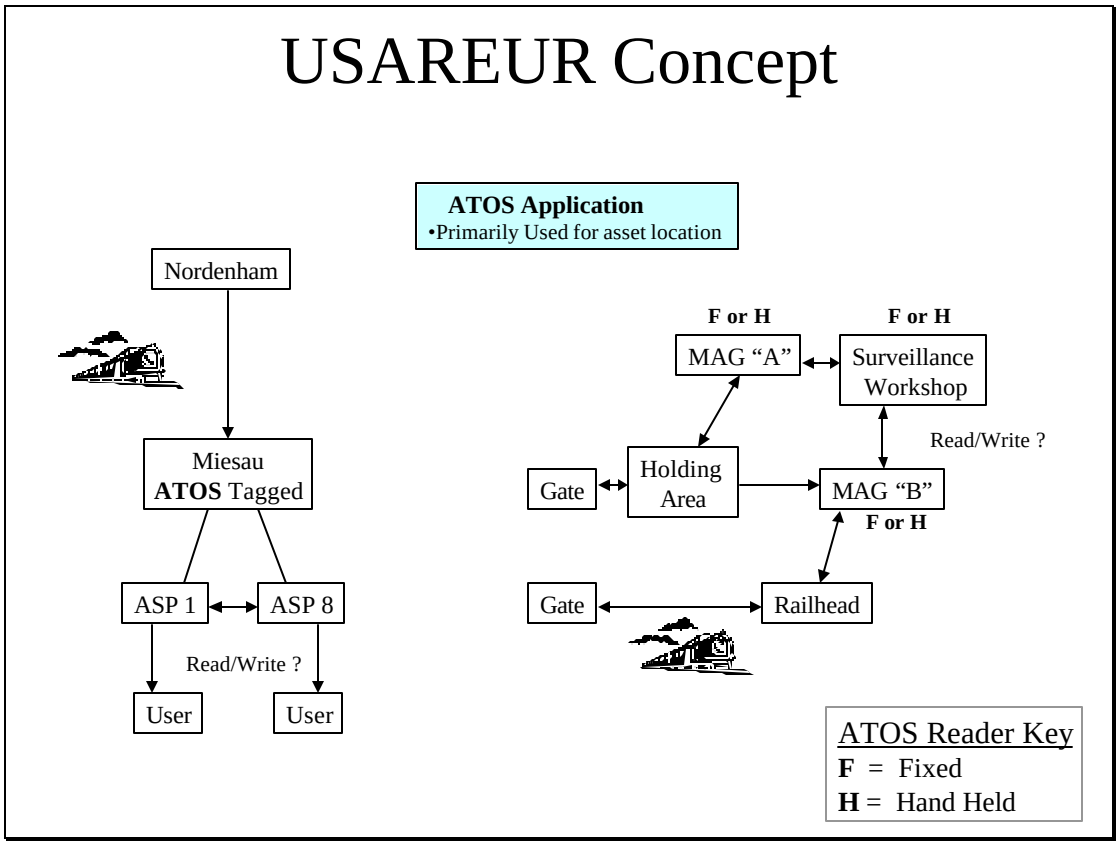

Figure 3.

USAREUR Use Concept Narrative

The USAREUR slide shows two parts and with very basic scenarios of intransit visibility where fixed or handheld assets might be used:

The left side shows the intransit shipment of ammunition from Nordenham to Miesau Storage Depot. The majority of in-theater ammunition shipments originate at Miesau out to the various Ammunition Supply Points (ASP) as shown with ASP 1 and ASP 8. The ASPs will further issue ammunition to the Users. On occasion shipments are throughput directly to the appropriate ASP.

The right side shows the types of locations within a storage point where ammunition might be located. An initial receipt of ammunition will move through the Miesau (rail) gate to the railhead for offloading of railcars, and then stored in location MAG B. Also an initial receipt of ammunition will move through the Miesau (truck) gate to the Holding Area, and then continue on for storage in location MAG A or MAG B. Periodically ammunition is moved from the locations MAG A or MAG B to the Surveillance Workshop for inspection, or to a Maintenance Building, and then returned to the appropriate storage location.

2.1.2.3 NAVEUR Concept.

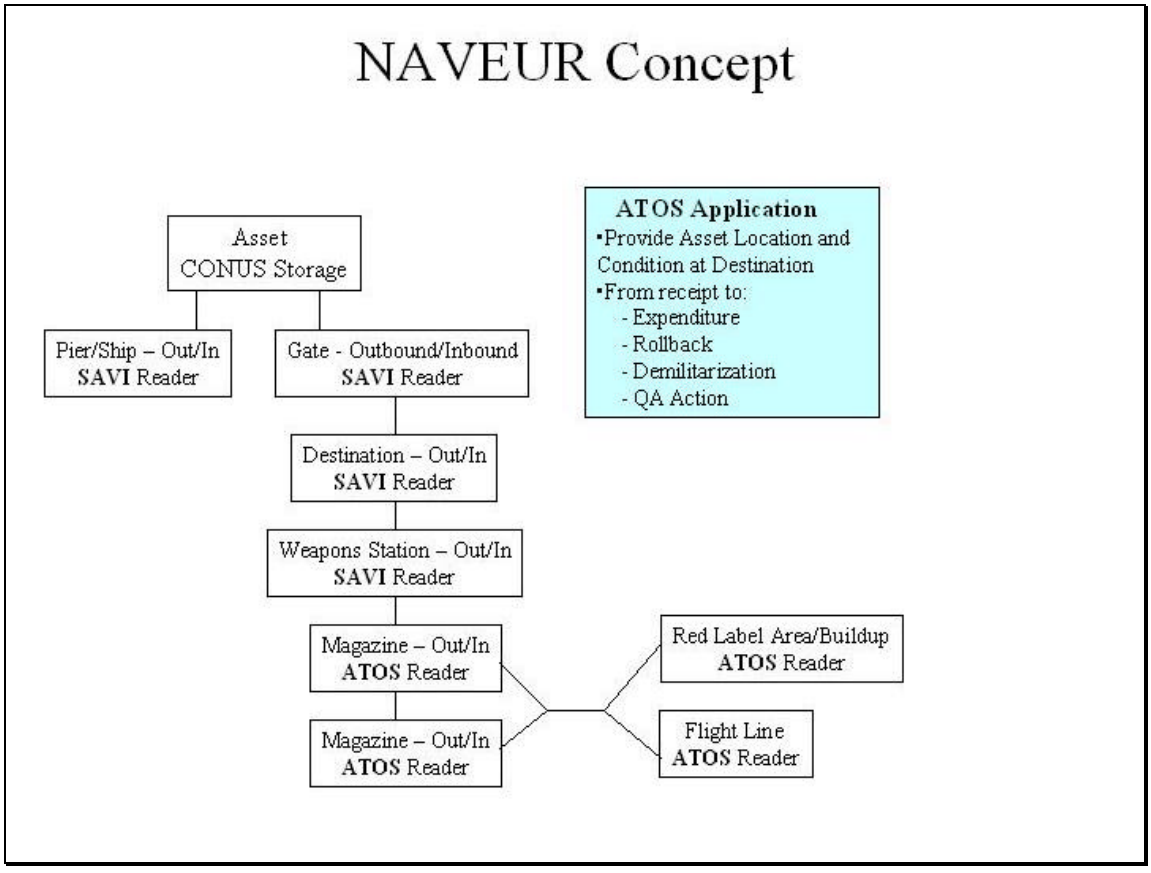

Figure 4.

NAVEUR Use Concept Narrative

The above slide addresses ONLY the NAVEUR theater portion and not the CONUS portion of the load out/transportation of assets.

As assets arrive via ship (USN, USNS, Contract Carrier) or airlift, upon download to pier or air terminal, the "global" tag (in the case of containerized assets) is read OR the ATOS tag is read by a reader at that receiving location once the container is unloaded or when containerization is not applicable. Assets are then transported to the storage areas (tunnels, open storage areas or magazine area). Assets are "read" at the entrance to all these areas and again at each separate magazine as the assets are stowed. As assets are removed for maintenance, buildup, shipment movement to other areas (i.e. red label area, back to pier FFT downrange, etc..) these assets are "read" again as they pass out of their stowage area and picked up by another reader at the next point of stowage, holding, departure. For assets that are expended, it is assumed that a manual input will still be necessary to account for their final disposition.

For surveillance purposes, environmental data may be picked up/recorded by readers at all of these locations as in the case of inventory data capture.

In both instances, inventory and surveillance, portable readers may be used to capture data at a pre-determined cycle and where fixed power sources are not available or desirable (such as a fwd ASP for a MEU) as long as input/download to the current USN/USMC AIS is possible within a timeframe required by the accountable ordnance officer/manager.

Retrograde of materials is the reverse of this process.

2.1.2.4 OSC Concept.

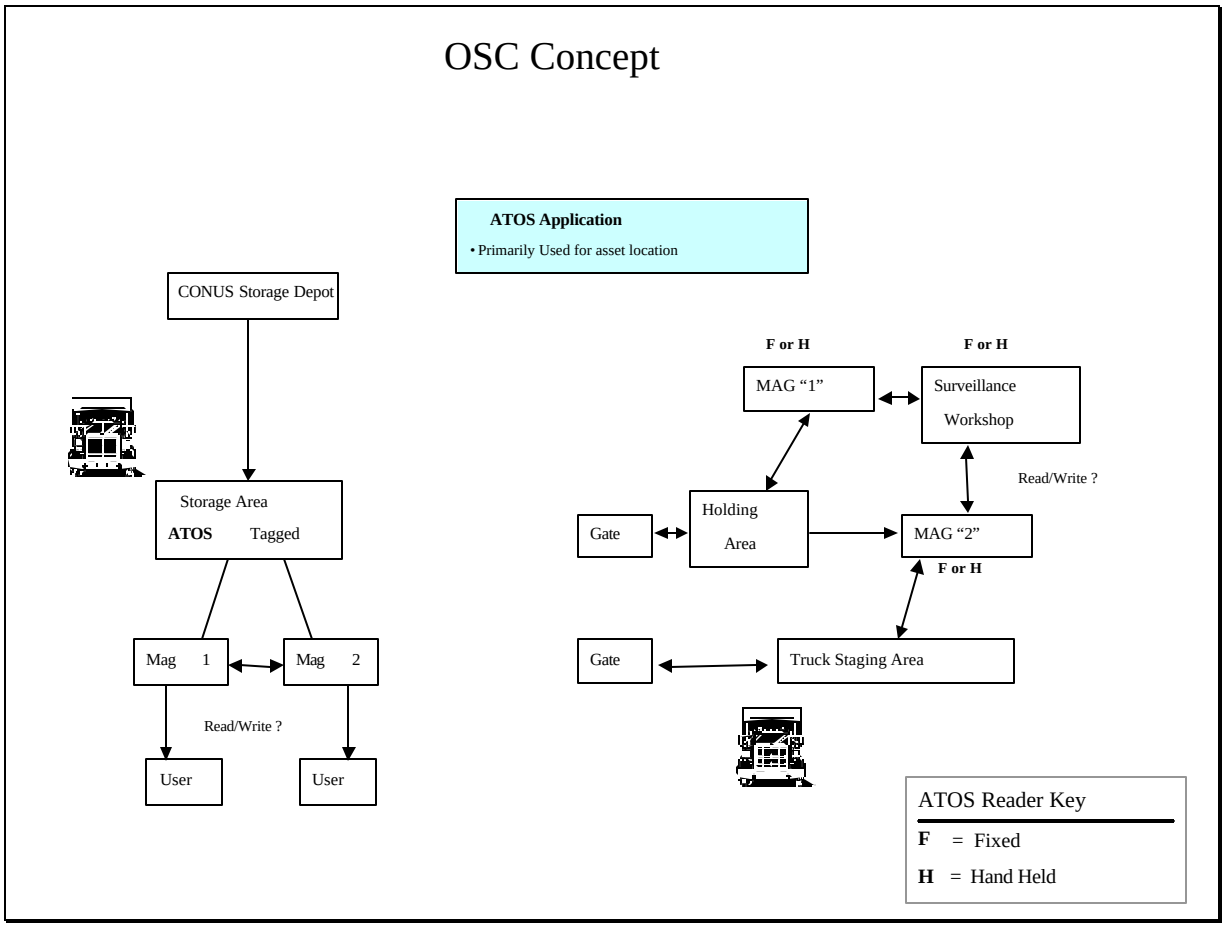

Figure 5.

OSC Use Concept Narrative

Operation Support Command's concept for use of this technology is as follows. Ordnance items will arrive at the storage facility identified. When items arrive at the storage site, they will be transported to the holding area for marking. An ATOS tag will be applied to each pallet or container at the holding area after the inventory management data and item identifiers are entered. The tag will already have the environmental sensors built-in but will require association to the ATOS "license plate" identifier. The ATOS tag will provide inventory and environmental data upon activation and be stored in the pre-processor data base. The item will then be placed in a magazine where fixed readers will already be installed.

Ammunition items may be transported on-post to the surveillance workshop, the holding area, the truck staging area, maintenance lines, and/or to other magazines. As the item continues through normal depot storage processing and traverses through RF readers, data will be entered transmitted via a fixed or hand-held reader to the preprocessor data base and the accountable inventory system. Changes in

inventory data (i.e., issues, turn-ins, condition code changes, changes in ownership, changes in grid location, etc.,) and item identification due to disassembly will be recorded.

At issue, items will be transported to the truck staging area for transport off-post and visibility of the asset will be dropped from the preprocessor data base and transferred to the intransit visibility system. The end result is total visibility for the ordnance item during the storage process.

2.2 TECHNICAL APPROACH

2.2.1 General Approach: ATOS will use standard development methodologies which perform lower level testing on laboratory benches and as the design maturity grows, the type and complexity of testing will increase in sophistication. Testing will include component, system, and subsequently an operational demonstration.

The RFID tag will be credit-card-sized, affixed to designated assets or pallets. The tag is intended to be low-cost ($5-15), disposable, and maintenance-free with a service life of at least five years at 70F. It will monitor environmental conditions by transmitting sensor data at user-defined intervals. The tag can store data for up to 90 days when not in communication with a reader. The demonstration tag will include temperature and humidity sensors along with two general-purpose standard sensor interfaces, which will eventually allow for additional environmental sensors such as shock and vibration. The readers communicate with the tags and the pre-processor database. The readers have the option to send data to the pre-processor database via a coaxial or RF Local Area Network (LAN) or other means. The pre-processor database aggregates and sends tag data to service Automated Information Systems (AIS).

2.2.2. Technical Approach

- Radio Frequency Identification (RFID) “tags”. The ATOS tag circuit, including sensor and sensor interfaces, microprocessor, memory, and UHF RF section is intended to be a single Application Specific Integrated Circuit (ASIC) to reduce unit cost and increase reliability. Tags will use a combination of RFID with sensors to capture environmental data. A standard interface for up to four sensors will be developed and the tag will be deployed with two sensors. The complete tag (sensor and sensor interfaces, microprocessor, memory and UHF RF section) is intended to be a single Application Specific Integrated Circuit (ASIC) to reduce unit cost and increase reliability.

- Fixed, portable and hand-held readers to collect the data will be employed. Fixed readers will be deployed in CONUS and OCONUS magazines and other fixed storage facilities, as practical/allowed and portable readers will be used where establishing a fixed reader is not practical (i.e. when fixed power sources are not available). Handheld readers will be used for updating/communicating with ATOS tags on demand.

- The preprocessor database will accept both inventory and environmental data from the tags. Inventory data will be compiled and provided in applicable format for the appropriate AIS (i.e. ROLMS, SAAS-MOD, SDS, CAS-B) to accept. Environmental data will be provided for current and future database applications. It is expected that the preprocessor database will exist on either a standalone PC or with existing system hardware.

2.2.3 Technical Risk

The challenges for ATOS are integration of the supporting software (Preprocessor) into service AIS (i.e. ROLMS, SAAS-MOD, SDS, CAS-B) in such a manner that it operates with minimal impact to the users in terms of training and system footprint modification. These challenges involve technical issues of integration, and programmatic issues of interface development schedule and management. The challenges are being addressed at the technical level through phased design, implementation, and testing and adequate interface control documentation; and at the programmatic level through the Joint Ordnance Commanders Group (JOCG), involvement with the Conventional Ammunition Integrated Management System Ordnance Information System (CAIMS OIS) quarterly design reviews and routine liaison with mangers of other legacy and migrating computer systems which may receive the ATOS system outputs. Model development needed to increase the accuracy of service life predictions will require that destructive testing and other techniques continue to be used to establish accurate correlations between the test data and environmental history of each item tested.

Additionally, there is a need to insure that the emerging DoD data element and data syntax standards are adopted, and that global RF transmission frequency requirements are complied with. Although the system's tag operations will involve very low power levels, emission control requirements, explosives safety standards, and electromagnetic compatibility between the ATOS system and other emitters/receivers in expected environments must be investigated and interference issues properly addressed.

2.2.4 Interoperability

ATOS must provide data which is compatible with and capable of being interfaced to service ammunition AIS to include ROLMS, SAAS-MOD, SDS, and CAS-B. A standard interface will be developed to support providing data from a central environmental data repository to QE/QA databases. ATOS must operate on non-interference basis with other RF systems.

2.2.5 Military Facilities and Equipment.

HQ, OSC and USEUCOM components will provide access to magazines and access to ordnance items to support the demonstration for the Military Utility Assessment. Access to ship magazines will be coordinated by NAVSEA with CINCLANTFLT. Specific locations and equipment will be identified in the ATOS Demonstration Plan. NAVSEA will coordinate with each service for a stand alone service AIS for demonstrating the ATOS Pre-Processor Database (PPDB) interface capability.

2.3 DEMONSTRATION STRATEGY.

During the development and assessment phase, ATOS will be tested using a parallel (static and mobile) demonstration approach. The static demonstration will involve CINC identified critical munitions in CONUS storage and on Navy ships. These critical munitions will remain in storage for the duration of the demonstration and the attached ATOS tags will provide visibility and environmental data as designed. The mobile demonstration is designed to exercise the tags in a routine storage-transit-storage (CONUS to OCONUS) movement environment. The mobile demonstration will involve tagging pallets or boxes of munitions in a CONUS depot that are routinely shipped to USEUCOM such as training ammunition destined for Stabilization Force (SFOR), Kosovo Force (KFOR) or Operation Northern Watch (ONW)/Operation Southern Watch (OSW). Although we will also utilize the current SAVI in-transit visibility system during this part of the demonstration, it will in no way have an impact on the ATOS Military Utility Assessment(MUA). The mobile segment(s) will add the element of data continuity as well as the system's utility in a field storage environment. Demonstration of the surveillance capability will hinge on successful transfer of accurate environmental data to a central data repository.

Details of the demonstration will be documented in the Demonstration Concept of Operations (CONOPS) and can be found at http://www.ih.navy.mil/atos .

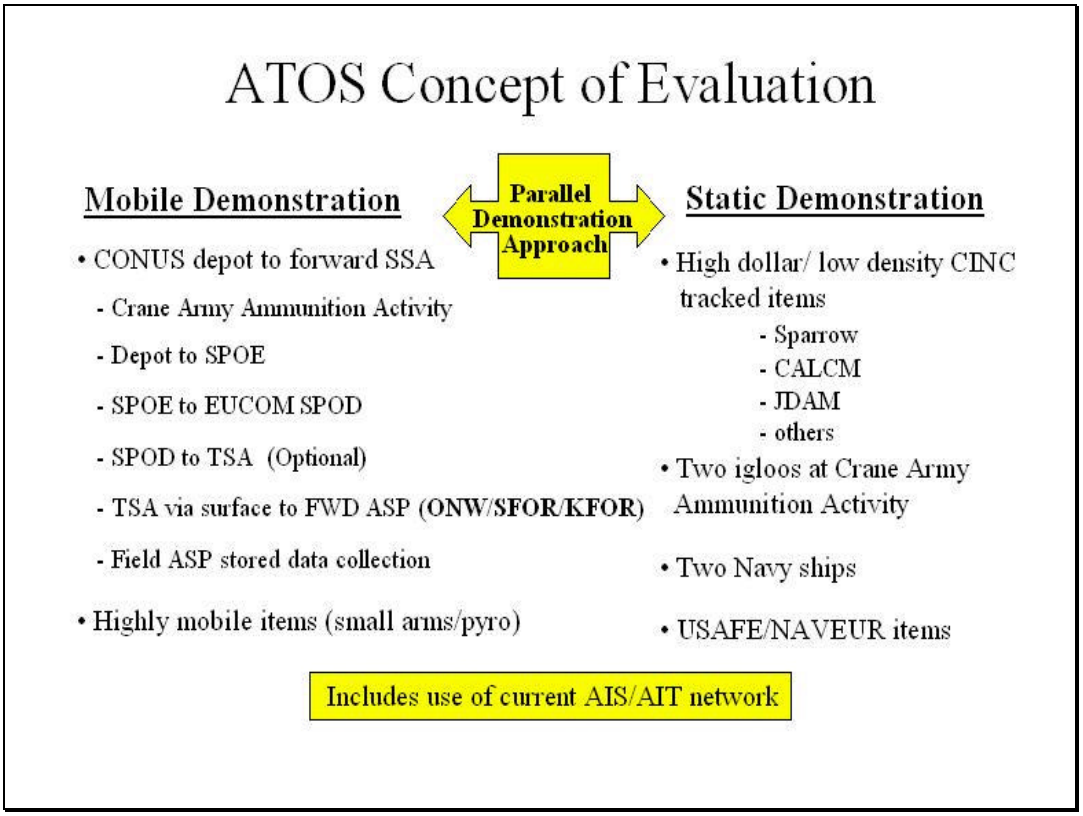

Figure 6.

2.4 ASSESSMENT STRATEGY.

2.4.1 Overview. The results of the ACTD operational tests will be assessed by the USEUCOM in coordination with OSC and reported to DUSD AS&C, the Joint Staff J8, and Service participants in a final report of military utility. This report concludes the development and demonstration phase of the ACTD.

2.4.2 Critical Operational Capabilities. Six capabilities are addressed in the program's operational objectives. These include, within the proximity of a reader, ATOS's ability to:

- Provide near real time asset data to a service AIS.
- Identify arrival of munitions to and departure from a storage area..
- Assist in locating specific munitions within storage area.
- Provide periodic and on-demand environmental data for munitions.
- Facilitate an alarm signaling extreme environmental conditions.
- Provide indications of munitions movement.

2.4.3 Measures of Effectiveness/Measure of Performance. Success metrics will be applied to the technology demonstration to determine the technical aspects of military utility. The baseline measures of effectiveness (MOE)/measures of performance (MOP) for the ATOS ACTD are shown below:

ATOS Component	Measures of Effectiveness	Measures of Performance
RFID Tag.	1. Transmit location/environment data. 2. Low cost. 3. Read/Write. 4. RFID read schedule. 5. Read Range	1. Longevity. 1.a. – 90-day memory. 1.b. – 5-year battery life. 2. Reliability 2.a. – 99% accuracy. 3. Read frequency.

		4. Read Range 300 ft.
Microelectro-mechanical Systems (MEMS)	1. Temperature 2. Humidity	1. Zero Tolerance
Fixed Reader.	1. Relay data within HERO and power restraints. 2. Safety 3. Time Stamped Data Elements	1. Reliability. 2. Read Distance/Range. 3. HERO Compliance 4. Accuracy
Portable Reader	1. Relay data within HERO and power restraints. 2. Safety 3. Environmental Operations 4. Operating Battery Life 5. Time Stamped Data Elements	1. Reliability 2. Read Distance/Range 3. HERO Compliance 4. Hardened/Ruggedized (Extreme Environments) 5. Establish Realistic Storage Capacity 6. Accuracy
Handheld Reader.	1. Collect data within HERO restraints. 2. Transmit data within HERO restraints. 3. Safety 4. Time Stamped Data Elements 5. Battery Life	1. Range 2. Timeliness of download. 3. Reliability. 4. HERO Compliance 5. Accuracy
Pre-Processor.	1. Format data suitable to alert users of location/environment changes. 2. Track and maintain history of RFID. 3. Interoperable with existing host AIS.	1. Timeliness 2. Alert capability. 3. Host certification.
Software interface.	1. Interoperable with existing ordnance systems. 2. Location/environmental data exchange.	1. Certification for use with service AIS

2.5 TRANSITION AND RESIDUAL STRATEGY

The Navy, as the lead for all transition activities, will designate a program Transition Manager. This individual will lead the effort to ensure joint acceptance of ATOS and certification of the system for joint

usage on selected service systems. As a program residual, a sufficient number of ATOS systems will be provided for USEUCOM to address their most critical shortfalls.

The Concept of Operations (CONOPS) for the employment of those ACTD products deemed militarily useful will be developed in conjunction with service and CINC use.

NAVSEA will provide residual assets (exact numbers TBD) for possible use in additional follow-on testing or as engineering/manufacture development assets. The final disposition of the demonstration assets will be determined by USEUCOM at the completion of the ACTD Operational Demonstration.

Any follow-on development, developmental testing, initial production, or operational assessments will be led by NAVSEA. While an official Life Cycle Cost Estimate for ATOS is still being generated, present estimate of the production unit cost for each tag is $5-$15 based on a buy of TBD systems.

The derived technology from the ATOS ACTD will be offered to USEUCOM, NAVSEA, OSC, and other U.S. Department of Defense organizations.

Transition costs for CONUS Navy magazines and all Navy Ordnance spread over 5 years from MUA completion has been calculated and will be budgeted for. These costs, however, have not been developed for the other services. The contract for this system will be written to accommodate procuring all needed systems, but each service must determine and budget for its own requirements. The transition manager will take the lead to interface with each service and document the requirements and implementation strategy. Acquisition for each service will be covered with provided resources. Model development to make full use of newly provided environmental data is the responsibility of each service. Collaborate efforts will be pursued as practical.

SECTION 3

PROGRAMMATIC AND ORGANIZATIONAL APPROACH

3.1 ORGANIZATIONAL ROLES AND RESPONSIBILITIES

The organizational structure for the ATOS ACTD provides:

- Visibility into, and control over, ACTD planning and execution by an Oversight Panel;
- Review of program status and progress through the Integrated ACTD Management Team;
- Detailed program development and transition activities by Integrated Product Teams (IPTs);
- Program Management by the Service assigned Co-Technical Managers;
- Evaluation of the military utility of ACTD products by a USEUCOM assigned Operational Manager (OM);
- Transition Management by a USN assigned Transition Manager (XM);
- Program participation by selected USEUCOM components and DoD agencies.

Figure 7. below depicts the overall line organization for management of the ACTD. Under each manager are found Integrated Product Teams (IPT).

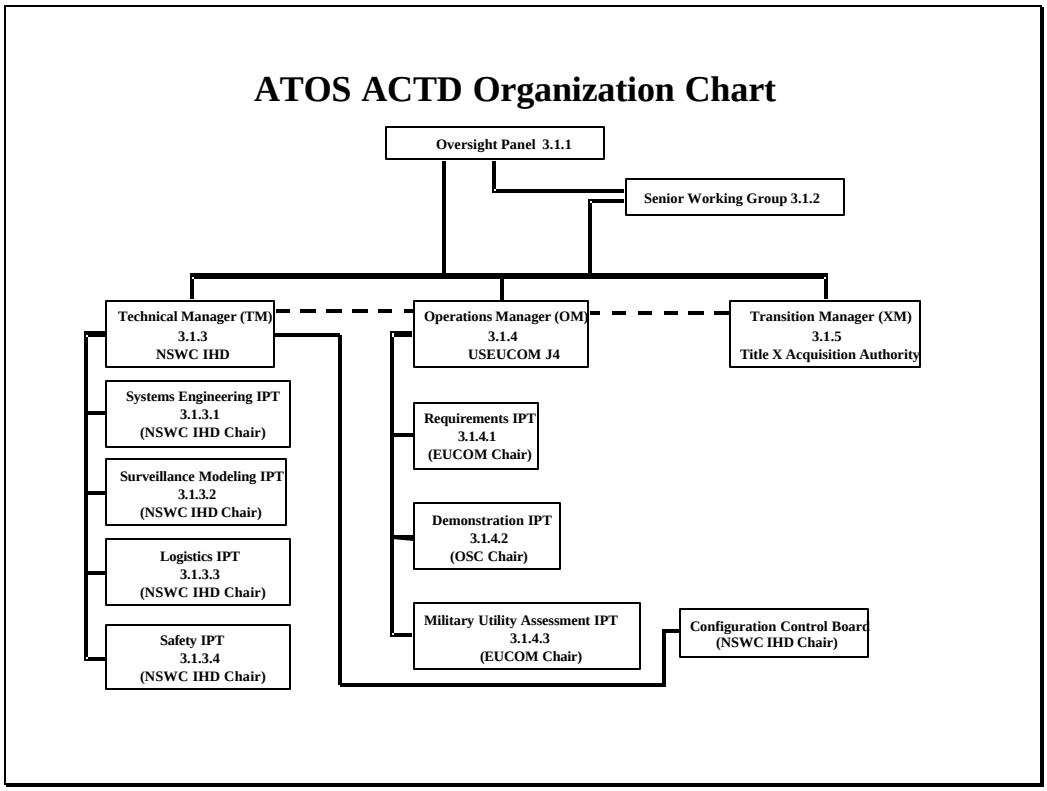

Figure 7.

3.1.1 Oversight Panel. The Oversight Panel meets annually to review program status and provide guidance and decisions on executive level issues to include program funding, schedule, and products. This panel is co-chaired by the Deputy Under Secretary of Defense (DUSD) for Advanced Systems and Concepts (AS&C) and USEUCOM Chief of Staff. Panel members include the program Technical, Operational, and Transition Managers and representatives from those services/agencies that provide program funding.

3.1.2 Senior Working Group (ATOS Management Team). The Senior Working Group meets quarterly to review working-level issues regarding program management. The team is comprised of the Technical, Operational, and Transition Managers as well as the DUSD AS&C Program POC. Additionally, the team may invite other individuals to participate in the working group to address specific issues related to program management. This group is responsible to provide the Oversight Panel a semi-annual status report of the ATOS ACTD program. It also provides oversight management of the working IPTs. The Senior Working Group provides input to the following program management issues:

- Validating Program Documentation (e.g., FRD and Demonstration Plan);
- Identifying, coordinating, and resolving programmatic issues that include funding, schedule, scope, demonstration, and assessment.

3.1.3. Technical Manager (TM). Naval Sea Systems Command, Naval Surface Warfare Center, Indian Head Division. The TM is responsible for overall program management, interagency coordination/agreements, advocacy and management of Research, Development, Test and Evaluation (RDT&E) funding, scheduling, site support, and data acquisition. This includes:

- Providing ACTD program management;
- Coordinating development activities including lead of Systems Development Engineering, Surveillance Modeling, and Logistics areas;
- Coordinating with other service Quality Assurance/Quality Evaluation organizations on issues relating to munitions selected for modeling and demonstration;
- Providing training resources and support associated with development and demonstration of ATOS system technologies;
- Coordinating activities associated with System Engineering (SE), Surveillance Modeling, Resource Management, Logistics, and Explosive Safety Working Integrated Product Teams;
- Coordinating technical support for ACTD demonstration;
- Providing technical support to Military Utility Assessment, as required;
- The Configuration Control Board (CCB) falls under the cognizance of the Technical Manger and will coordinate and report results of developmental testing of ACTD technologies to establish and refine the configuration requirements for ATOS. The Configuration Control Board is chaired by NSWC IHD and membership includes representation from the Technical Manager IPT's and other personnel as designated.

The TM will coordinate with appropriate agencies, as a minimum, personnel and explosive safety, interoperability, COMSEC, COM-ELEC standards, and spectrum allocation/discipline.

3.1.3.1 Systems Engineering IPT. The Systems Engineering IPT ensures sound design and functionality of the ATOS system. The IPT is chaired by NSWC IHD and membership includes representation from USEUCOM, and OSC. The IPT reports to the Technical Manger. The IPT is responsible for development of the ATOS system.

- Determining interface requirements for service designated Automated Information Systems;
- Coordination development of demo AIS versions;
- Developing IT specifications and databases;
- Specifying and developing ship and land LAN interfaces;
- Preparing documentation for RF host nation approval process;

- Developing system requirements for RFP;
- Evaluating contractor proposals;
- Performing preliminary component-level test and evaluation;
- Conducting Site Surveys of designated Ammunition Logistic Activities;
- Assisting development of demonstration plan;
- Performing system-level intermediate test and evaluation (IT&E);
- Providing support as necessary for MUA.

3.1.3.2 Surveillance Modeling IPT. The Surveillance Modeling IPT will assist in facilitating the fusion of information between Program Offices, Quality Assurance/Quality Evaluation (QA/QE) organizations, and the ATOS IPTs. NSWC IHD chairs the IPT and membership includes representation from USEUCOM and HQ, OSC (DAC). The IPT reports to the Technical Manager and is responsible for coordinating with Program offices and Quality Assurance/Quality Evaluation (QA/QE) organizations to:

- Provide input into sensor identification and selection;
- Provide input into the development of the PPDB, associated data tables, and required algorithms;
- Facilitate and coordinate testing activities, identified as required, for the PPDB development, associated data tables, and algorithms;
- Identify threshold values for selected sensor(s), where available, for the munitions chosen for inclusion in the ACTD demonstration;
- Assist in identifying the required Research and Development (R&D) for model development and validation, as well as future/potential sensor selection for later versions of the ATOS tag (e.g. embedded tag).

3.1.3.3 Logistics IPT. The Logistics IPT will ensure adherence to the tenets of "Joint Vision 2010, Focused Logistics" to facilitate the fusion of information, logistics, and transportation technologies. The IPT is chaired by NSWC IHD and membership includes representation from USEUCOM and OSC. The IPT reports to the Technical Manager. The IPT is responsible for:

- Documenting user requirements for ATOS system functionality;
- Development of Configuration Management Plan;

- Conducting site surveys of designated ammunition logistic activities;
- Developing logistics documentation;
- Developing ATOS User's Guide;
- Developing and providing initial training for ACTD;
- Ensuring supportability and maintainability of ATOS system;
- Coordinating logistics efforts with various IPT's;
- Providing support as necessary for MUA.

3.1.3.4 Systems Safety IPT. The Systems Safety IPT will ensure all applicable safety standards are adhered to. These include but are not limited to explosives, personnel, equipment and environmental safety. The IPT is chaired by NSWC IHD and membership includes representation from USEUCOM and OSC. As a minimum, coordination with Joint and Service Safety organizations will be conducted.

3.1.4 Operational Manager. USEUCOM is the operational sponsor and will evaluate ATOS technology to determine military utility. ECJ4 designates the program operational manager responsible for coordinating the day-to-day activities associated with program execution. Coordinates activities associated with the Requirements Integrated Product Team (IPT) and the Demonstration IPT and Military Utility Assessment IPT.

3.1.4.1 Requirements IPT. The Requirements IPT validates and refines operational requirements for the employment of the ATOS program technologies and develops supporting CONOPS necessary for demonstrations and military utility assessment. The IPT is chaired by USEUCOM J-4 and membership includes representation from USEUCOM service components, NAVSEA, and OSC. The IPT reports to the Operational Manager and is responsible for the following:

- Validate Operational Requirements and publish Functional Requirements Document (FRD);
- Develop supporting demonstration operational concept for employment;
- Review Demonstration Plan;
- Report consolidated findings to Operational Manager (OM).

3.1.4.2 Demonstration IPT. The Demonstration IPT will be chaired by HQ, OSC and will be responsible for the following as they relate to the ATOS Demonstration:

- Development of the overall demonstration CONOPS;
- Demonstration sites, LOC, and test munitions selection and coordination;
- Demonstration data collection (including data used in coordination with AFOTEC and JITC (see paragraph 3.1.7);
- Demonstration scheduling;
- Coordination of mobile demonstration with US Transportation Command (USTRANSCOM);
- Coordination of outstanding/unfunded/unmanned demonstration issues.

3.1.4.3 Military Utility and Assessment (MUA) IPT. The MUA IPT coordinates and develops supporting plans for operational demonstrations and assessment. The IPT is chaired by USEUCOM and membership includes representation from USEUCOM service components, and HQ, OSC. The MUA IPT is responsible for the following tasks:

- Determine overall Military Utility Assessment of the ATOS ACTD;
- Develop demonstration assessment plan;
- Identify and modify MOEs/MOPs;
- Coordinate the development of and evaluate Demonstration Assessment Reports;
- Report assessment findings to the Operational Manager (OM).

3.1.5 Transition Manager (Lead Service). Naval Sea Systems Command, Naval Surface Warfare Center, Indian Head Division will designate the appropriate Program Transition Manager. The Transition Manager (TM) will:

- Review Military Utility Assessment;
- Coordinate joint usage and acquisition activities;
- Lead development of Implementation Plan for Transition to supporting service/joint fielding;
- Develop Operational Requirements Document (ORD);
- Coordinate with other CINC, Service, and Agency development efforts;
- Assume cognizance of the Configuration Control Board.

3.1.6 Supporting Program Participants.

3.1.6.1 U.S. Army Operations Support Command (OSC)

- Coordinates demonstration CONOPS development and provides two CONUS magazines for CONUS related demonstrations;

- Provides support in the area of Quality Assurance Specialty Ammunition Surveillance (QASAS);

- Supports Lead Service activities related to transition.

3.1.7 Interoperability.

Interoperability is a key guiding principle for the development of the ATOS system. ATOS must achieve maximum interoperability to the degree current technology allows, while effectively considering the costs, schedule and other required performance tradeoffs. In order to ensure optimum interoperability with other related DoD systems and be able to meet its performance specifications within the various operating environments, ATOS components and the ATOS system as a whole must be able to be integrated into the Joint logistics processes with the least disruption, including the minimization of changes to be made to existing automated information systems(AISs) and the maximization of benefit to the warfighters.

The ACTD evaluation must include measurement of the degree to which the ATOS system conforms to related established DoD standards and is compatible with other Automatic Identification Technology (AIT) material labeling techniques. The ATOS system should strive to be backwardly compatible with existing barcode formats as necessary to facilitate effective operations. To accomplish this, the ATOS system development team must consider, and to the greatest degree possible, adapt emerging standard DoD data elements and syntax, operating frequency standards including consideration of host nation restrictions, application program interfaces between system devices and information technology software applications and databases, as well as application operating systems and information architectures. Also, the system developers must be mindful of applicable Joint and Theater CINC guidance on the deployment and use of logistics IT systems and DoD timeliness criteria to ensure that Joint Total Asset Visibility goals are achieved and maintained.

3.2 SCHEDULES

3.2.1 TECHNOLOGY SCHEDULE

The basic technology development and integration approach by FY will be:

- 2001: Develop system CONOPS and hardware and software specifications. Prepare and publish manufacturer's solicitation.

- 2002: Select multiple COTS system contractors and begin parallel development of competing systems from each manufacturer's proven basic COTS design. Perform component and system testing and down select for the final demonstration.
- 2003: Complete integration into service systems selected for demonstration. Perform final demonstration and prepare the Military Utility Assessment.
- 2004-2005: Maintain residual ATOS system used in final demonstration by USEUCOM. Begin transition of ATOS capability with identified improvements.

3.2.2 PROJECT SCHEDULE

A detailed schedule can be found at http://www.ih.navy.mil/atos/

3.3 FUNDING

Organization/Agency	FY01	FY02	FY03	FY04	FY05
Department of the Navy	3.9M	4.7M	4.0M	3.8M	3.8M
DUSD AS&C		1.0M	.6M	.62M	.62M
Total	3.9M	5.7M	4.6M	4.42M	4.42M